Key Recommendation: Manage and Conserve Water and Energy Resources

Overview

Water and energy resources play an obvious, yet often overlooked, role in sustaining economic and environmental prosperity in our seven-county region. Though Lake Michigan provides clean, inexpensive water, the lake's capacity to serve the region's need is not limitless due to legal constraints on its use. Other parts of the region face increasing expenses and environmental side effects due to their dependence on groundwater. Likewise, spikes in price for natural gas and gasoline in recent years serve as a reminder that current energy resources are finite and that their cost will increase as they grow scarcer.

The conservation of energy and water is a top priority for *GO TO 2040*. Over the next 30 years, these resources will become more constrained, affecting pricing and usage for businesses, local governments, and residents alike. By taking a proactive approach to resource conservation, the region can avoid price shocks farther down the road, while saving money in the short term. Conservation brings economic and environmental benefits, and steps can be taken now to give northeastern Illinois opportunities to prosper in a new, greener economy. The region needs to become more efficient in its use of resources so that economic development can continue as energy and water use flatten.

Specific recommendations for management and conservation of water and energy resources are broken into three categories:

1. Increase energy efficiency
2. Manage water resources sustainably
3. Decrease energy use in water and wastewater utilities

CMAP recommends the following actions to increase energy efficiency:

- **Implement policies to reduce congestion and reliance on automobiles.** *GO TO 2040*'s emphasis on compact, mixed use, walkable developments served by transit will improve the region's energy efficiency. In addition to promoting lower-energy modes of travel, efforts to reduce congestion will reduce wasted fuel.
- **Promote retrofit programs.** Retrofit programs provide assistance to property owners to install energy conservation measures of existing buildings, and exist at the local, state, and federal levels already. The CMAP-led Chicago Region Retrofit Ramp-Up project will be an important first step in streamlining access to information, financing mechanisms, and skilled labor to transform the retrofit market.
- **Establish green building programs, ordinances, and sustainability plans.** Energy savings in new buildings can be significant when local and state codes, ordinances, plans, and programs support green development and practices.

- **Establish urban forestry and ecosystem restoration programs.** A large-scale tree-planting program in northeastern Illinois could cool air temperature by up to 2.5 degrees, which would lead to significant savings in air conditioning costs.
- **Foster sustainable practices led by local governments.** Communities should take the opportunity to pilot their own projects to promote small-scale renewable energy generation, which could include wind and solar power as well as strategies like waste-to-energy generation.

CMAP recommends the following actions to manage water resources sustainably:

- **Support water use conservation efforts.** Conservation measures can promote efficient use while reducing or deferring the need for a utility to increase its capacity. Examples include retrofitting water fixtures or higher efficiency models, or the adoption of sensible water conservation ordinances by local governments.
- **Implement full cost water pricing.** Current rate structures for water do not reflect the entire cost of supplying water, providing consumers little incentive to conserve water.
- **Integrate land use policies with water resources.** Land use policies that promote compact development will reduce residential water use and reduce both capital and operating costs for water utilities.
- **Use green infrastructure to manage stormwater.** Green infrastructure, like rain gardens and permeable pavement, when used for infiltration, evapotranspiration, and reuse in the management of stormwater has many benefits and is more cost effective when compared with gray infrastructure.
- **Use water footprinting as a standard audit method.** Calculating the total volume of water consumed by an individual, community, or business, otherwise known as a "water footprint," can be a useful audit method for large-scale projects and are helpful in identifying ways to reduce water consumption.

CMAP recommends the following actions be taken to decrease energy use in water and wastewater utilities.

- **Shift groundwater dependent communities to surface water supplies.** Shallow and deep bedrock aquifers are currently being pumped at rates that exceed the rate of recharge; communities that are dependent on groundwater should consider accessing water from the Fox and Kankakee Rivers.
- **Consolidate water utilities.** Over 300 water supply utilities provide water for the region, many of these utilities can be consolidated based on water source.
- **Promote renewable generation in water utilities.** Renewably generated energy can reduce energy consumption in water utilities.

While these recommendations offer many monetary benefits, conserving water and energy will help the region confront climate change. The energy and water efficiency recommendations in GO TO 2040 aim to combat the greenhouse gas emissions that cause climate change.

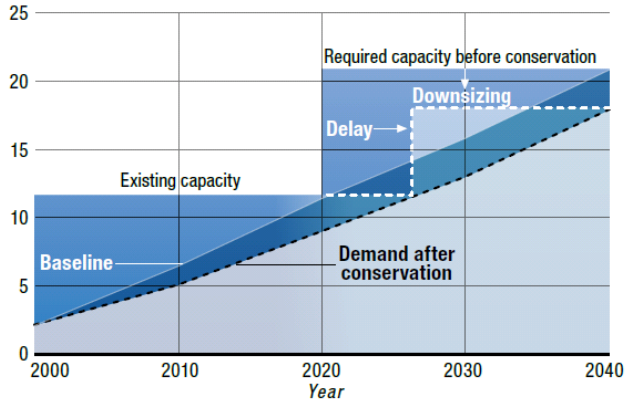
Benefits of Managing and Conserving Water and Energy Resources

The Regional Vision sets a goal for the region to be known for its high quality of water, and establishes that planning for water resources must be a high regional priority. It states that the region should be a leader in green building techniques, the production of green energy, and in providing energy-efficient transportation options. Additionally, during the "Invent the Future" phase of public engagement for *GO TO 2040*, participants identified energy reduction as one of the four most important indicators to track progress toward achieving the Regional Vision, along with regional economy, transportation choice, and land consumption. Energy conservation is part of many of the strategies in *GO TO 2040*, ranging from the mixed-use reinvestment that is part of promoting livable communities to the provision of a balanced supply of housing and jobs.

Benefits: Household and Municipal Finance

While there is generally an upfront cost to energy conservation measures, the stream of avoided costs continues long after the initial investment is repaid. Furthermore, there are many state and federal programs available to assist with the upfront costs to help encourage energy conservation by local governments, residents, and businesses. Based on 2005 prices, the average Chicago area household could save $550 per year in natural gas and electricity following a retrofit, while savings for a typical commercial account would be $6,400.[1] A particular energy or water conservation measure may not make sense in every case, but in general conservation pays dividends to the user. There is a clear financial motive for conservation.

Figure 21: Example of delaying or downsizing a capital facility,[15] *peak demand/capacity in million gallons per day*



Source: American Water Works Association, 2006. Water Conservation Programs – A Planning Manual. AWWA Manual M52, First Edition, page 75.

For municipal water utilities, water conservation can reduce or delay the need to expand capacity, presenting major capital savings. In the example of the water utility shown in Figure X, treatment plant capacity would be reached in 2020 if demand grows according to baseline. If water conservation is practiced instead, demand could be reduced so that expansion is not needed until after 2025. In this example, furthermore, the ultimate size (and therefore cost) of the plant after expansion can also be reduced, again because growth in demand will be limited with water conservation measures in place. Besides this, conservation programs are less expensive than developing new water supplies. They typically cost $0.46 – 1.40 per 1,000 gallons conserved, while the cost to develop new supplies would be well above the high end of this range.[2] Finally, although utilities sometimes fear they will lose revenue if they begin a conservation program, it is readily possible to make conservation revenue neutral by redesigning rates at the same time.[3]

Benefits: Economic

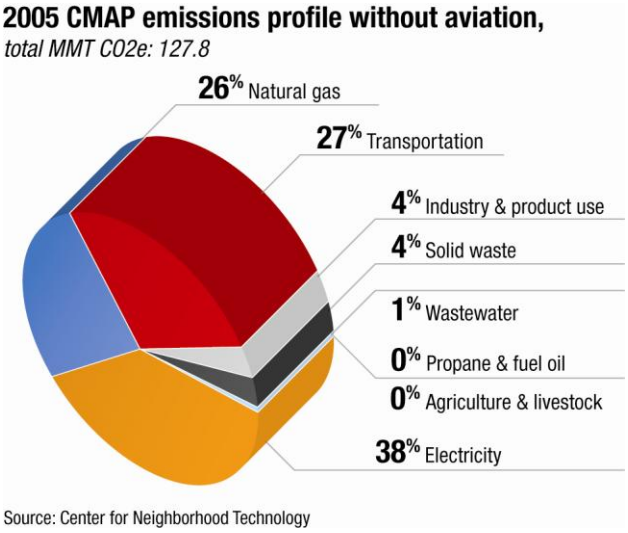
Increasing reliance on efficiency to meet water and energy needs also has a broader economic payoff, in that it directly and indirectly creates green jobs and induces job creation elsewhere in the economy. In fact, most of the "green jobs" expected to emerge in the Chicago region in the next decade are linked to energy use and conservation.[4] While estimates of direct job creation vary, it is likely that each $1 million investment in energy efficiency could lead to 8 – 10 full time jobs,[5] primarily in the skilled trades needed to conduct energy audits and install energy efficiency measures. Indeed, taking full advantage of the opportunity will require parallel investments in workforce training to establish a labor pool sufficient to, for example, undertake a large-scale energy retrofit program. The products and services needed from manufacturers and other vendors (e.g., compact fluorescent light bulbs, energy efficient windows, etc.) would account for indirect job creation on top of this. Similarly, it has been estimated that every $1 million of investment in water conservation programs directly and indirectly creates 15 – 22 jobs.[6]

Job creation induced by efficiency gains is expected to be substantial as well. Induced jobs are those created elsewhere in the economy, not immediately related to water and energy efficiency. California, for example, has managed to reduce its per-capita household energy consumption more than a third below the national average since state energy efficiency policies began to go into effect in the 1970s; at least 1.5 million net new jobs could be attributed to the diffuse, economy-wide effects of those household energy efficiency gains over the period 1972 – 2006, primarily because households were able to spend money on other goods besides energy.[7] Although job losses occurred in some parts of the energy sector, they were far outweighed by gains elsewhere. The non-renewable energy supply chain is generally less job-intensive than other areas of the economy, so being able to shift spending to other areas will, on balance, stimulate the creation of more jobs.

The benefits are wider when a shift to renewable energy is also considered. There are major opportunities for growth in emerging green industries, such as manufacturing components for wind turbines or solar panels, for manufacturers in the region, while headquarters and white collar jobs in renewable energy industries have a location advantage in the Chicago region as well.[8] A recent study revealed that 1,200 companies in the Chicago region were in industries producing one or more of the parts needed in wind turbines, while 680 companies were in industries manufacturing at least one part for solar panels.[9] Thus, while these companies may not currently manufacture parts for renewable energy generation, they are well positioned to branch into that market in response to demand. Likewise, the emergence of wind farms in or near metropolitan Chicago has been dramatic in the past few years following state and federal policies promoting wind power production. Construction, installation, and maintenance jobs on wind farms in or near the region could become promising careers in the near term.

Benefits: Climate Change Mitigation

Energy use is tightly linked with the greenhouse gas emissions (GHG) that cause climate change. For example, each kilowatt-hour of electricity used in the region — the equivalent of keeping a 100-W light bulb on for ten hours — is associated with the release of about 1.5 pounds of carbon dioxide into the atmosphere.[10] At 11 pounds of carbon dioxide per 100 cubic feet of natural gas, the average household generates about 9 lbs of carbon dioxide each month for heating and cooking.[11] Electricity and natural gas usage — which are mostly associated with energy use in buildings, like heating and cooling, appliances, etc. — make up almost two-thirds of the greenhouse gas emissions in the region (Figure X). Thus efforts to improve energy efficiency in buildings will also pay dividends in GHG reductions, helping to mitigate (reduce the severity of) climate change.



The transportation sector is the next largest contributor of GHG in the region after energy use in buildings. Most of the transportation emissions are from on-road sources, with most of that from passenger vehicles or light-duty trucks.[12] Using a gallon of gasoline releases about 20 pounds of carbon dioxide equivalent. Since the use of transit is associated with lower emissions per passenger mile than automobiles,[13] and biking and walking generate no additional carbon dioxide, promoting alternative modes of transportation as recommended in *GO TO 2040* also tends to mitigate climate change. Because the compact, mixed-use nature of a livable community also reduces the automobile trips its households make, developing livable communities tends to reduce greenhouse gas emissions as well.[14]

Carbon sequestration in plant biomass (tree trunks, root systems, etc.) may be a small but significant factor in the region's ability to reduce atmospheric carbon dioxide in the atmosphere. It is expected that the open space preservation and restoration recommended in *GO TO 2040* will help sequester carbon dioxide. Furthermore, a commitment to planting trees in urban areas could also help reduce cooling demand by controlling the heat island effect — the phenomenon that built-up areas tend to retain heat to a greater degree than less built-up areas — since reduced cooling demand will decrease GHG emissions.

There has been great interest, but little progress, in establishing national GHG reduction targets. CMAP firmly believes that this is necessary. The energy efficiency measures, the shift toward renewable energy, and other recommendations in *GO TO 2040* will go part of the way toward meeting widely accepted targets (described in *Key Indicators* below), but federal action is needed to reach them. At the same time, most atmospheric science researchers agree that some climate change effects will occur even if private parties and governments at all levels commit to reductions in GHG emissions. These effects include increased risks of flooding, mortality

associated with summer heat waves, and the spread of invasive species. It also threatens to intensify the demand for water while availability decreases. Increased average summer temperatures will make building energy efficiency even more important and financially attractive.

Benefits: Water Resource Protection

Rising demand for drinking water would have a number of negative consequences over the long term; the use of water conservation measures helps limit those effects. For example, withdrawals from shallow wells are known to be reducing groundwater discharge to streams, so that as pumping from shallow wells increases, water levels in some streams decrease. This is a threat to the fish, aquatic insects, and plants in those streams. Increased groundwater pumping has also led to changes in water quality, causing increased concentrations of arsenic, barium, radium, and salinity and requiring more expensive treatment to meet drinking water standards. After these chemicals are removed from drinking water at the treatment plant, they may have to be treated as hazardous waste, dramatically increasing the cost of disposal and therefore the overall cost of treatment. A number of communities in the region are already affected by barium and radium contamination, and this can be expected to become worse as pumping increases. At the same time, recent evidence shows that chloride contamination has increased dramatically over the past half-century in both shallow and deep wells around the region.

Benefits: Impervious Area Reduction

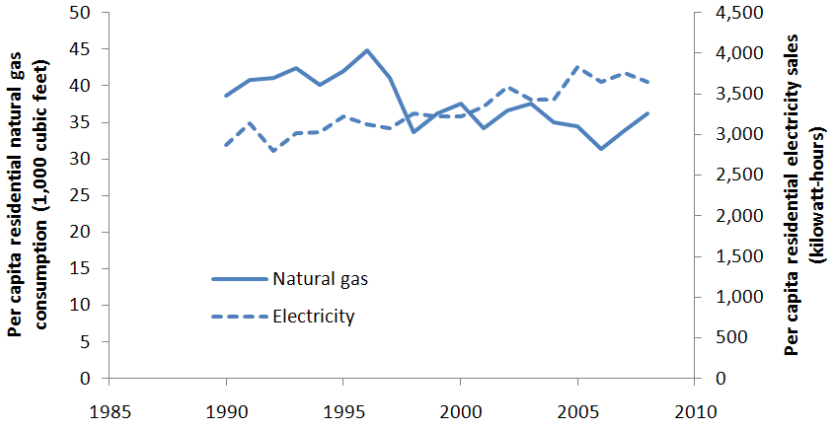
Impervious surfaces are parts of the landscape, like streets or roofs, that cause runoff rather than allowing rainfall to infiltrate. The amount of imperviousness in a watershed is strongly and negatively linked to the biological health of streams and lakes.[15] A distinction can be drawn between impervious areas that drain to surface waters, such as most conventionally designed urban streets, and those that do not, such as roof downspouts running out into a lawn. The former is "effective" impervious area, in that it is associated with increased runoff volumes and water quality declines in streams. The use of green infrastructure as recommended in *GO TO 2040* can significantly reduce impervious area, specifically effective impervious area. Green infrastructure tends to preserve, restore, or mimic natural hydrology, and it includes methods of using vegetation to promote infiltration of stormwater, uptake by plants, and other techniques to retain a portion of runoff onsite rather than discharging it.

Current Conditions

Current Conditions: Electricity and Natural Gas

In Illinois, electricity is largely generated from coal-fired and nuclear plants, with a small amount from renewable sources. Natural gas is used to generate additional electricity during periods of peak demand. However, most of the region's electricity is actually sourced from a wider electric power market covering parts of the Midwest and mid-Atlantic that relies more heavily on coal.[16] Electricity is delivered to customers through a distribution system owned by ComEd (aside from a small portion of Kendall County outside ComEd's service territory[17] and a handful of municipalities[18] that own the distribution network), although because of deregulation customers may now choose to purchase electricity from so-called "alternative retail electric suppliers."

While electricity used in the region is often generated hundreds of miles away, a small amount is also generated by much smaller power plants closer to where it is consumed. This is called "distributed generation," and can be deployed by large industrial or commercial users, large institutions, or a district of smaller users. The higher efficiencies, and therefore lower variable costs, of these systems is a reason to try to expand their use, and they represent a significant opportunity for the region. Individual households can also generate some of their electricity through renewable sources, typically wind or solar, and obtain a credit on their utility bills in proportion to what they generate. Illinois also has a Renewable Energy Portfolio Standard which mandates that an increasing proportion of electricity sold in Illinois each year is generated from renewable sources, topping out at 25 percent in compliance year 2024–2025.[19] Most of this would be from wind generation, although a small amount would be from solar.



Natural gas is delivered to customers in the Chicago region by one of three investor-owned utilities, although following deregulation there are also requirements to permit customer choice in natural gas suppliers. Very little of the natural gas used in Illinois is produced here, although the state is a major hub in the cross-country transport of natural gas via pipelines.[20] In the residential sector, natural gas is used primarily for space heating, but it also powers appliances like hot water heaters, clothes dryers, and kitchen stoves. Natural gas consumption by residential consumers in the Chicago region is slightly higher than that of commercial and industrial accounts, with 57 percent of the region's consumption attributed to the residential sector.

Electricity in the residential sector is primarily used for air conditioning, lighting, and a wide variety of appliances. Unlike natural gas, however, households are not the dominant consumers of electricity. They account for only 31 percent of electricity consumption; the remainder is used in the commercial and industrial sectors to power manufacturing equipment. Although natural gas consumption varies with the weather, in the residential sector consumption per household has been decreasing slightly over time as home insulation, windows, and heating systems become more efficient. On the other hand, electricity consumption per capita has been rising steadily, resulting mainly from the increasing size of homes, which adds to the space requiring cooling and lighting, and the profusion of electronic appliances.[21] Figure X shows the change in residential electricity and natural gas consumption in Illinois over the past two decades.

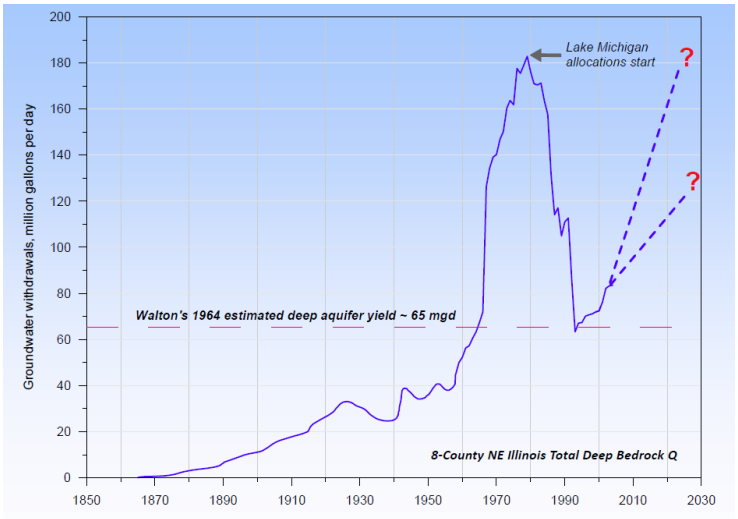
While the region has begun to make energy efficiency improvements in residential and commercial buildings, there is ample room for more, both in the suburbs and in the city. This is partly because of age: 21 percent of the region's housing units were built before 1939, and over half were built before 1970, well before energy codes went into effect. But more than age is at work. It has been noted that "even in comparison to other Midwest cities, Chicago is dramatically less efficient: a typical Chicago building uses twice the energy of a comparable building in the Midwest."[22] In response, retrofit programs aimed at lower-income residents as well as some market programs have emerged in recent years through the state, non-profits, and utilities. Besides those funded through the American Recovery and Reinvestment Act (2009), the biggest of these is likely the Energy Efficiency Portfolio Standard, enacted by the General Assembly, which calls for a reduction in electricity demand of 2 percent by 2015 each year afterward. Gas utilities also must meet a portfolio standard,[23] starting at 0.2 percent in 2011 and rising to 8.6 percent in 2020, increasing by 1.5 percent each year after that. These programs are spurring investor-owned utilities to fund programs aimed at reducing demand for gas and electricity.

Market-rate energy efficiency programs generally provide upfront financing for improvements that repay the investment through energy savings over time, and funding capacity remains low relative to the need. For example, consultants for the City of Chicago projected being short of the Climate Action Plan's retrofit goal for 2020 by more than one-third, even under optimistic assumptions, if further resources are not developed.[24] Furthermore, the numerous funding programs are fragmented and difficult to negotiate for households, businesses, and local governments. Thus, some financing programs, such as the funding available from the Energy Efficiency Portfolio Standard, are not being accessed to the degree that they could.

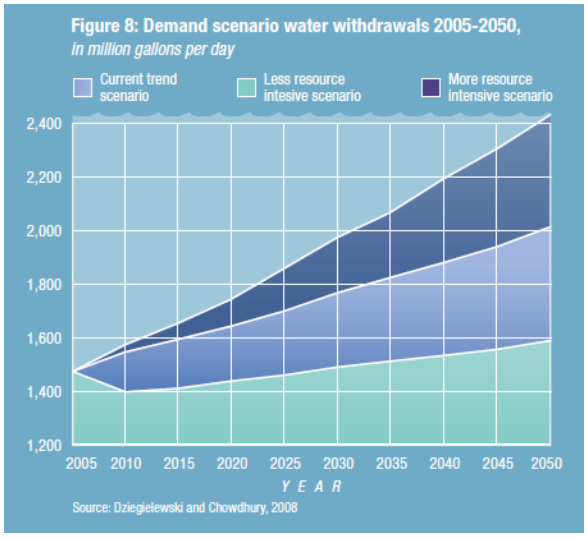
Current Conditions: Water Use

Historically the region has been considered water rich, and scarcity has been a minor issue. The region is bordered by Lake Michigan, one of the largest reservoirs of freshwater in the world, from which almost four-fifths of the people in the Chicago area receive their drinking water. Yet the region's use of Lake Michigan is constrained by a Supreme Court decree: users in Illinois are allowed to divert no more than about 2.1 billion gallons per day in total from Lake Michigan.

This limit was set following litigation with other Great Lakes states over the reversal of the Chicago River to drain into the Des Plaines River and away from Lake Michigan. Lake Michigan water is allocated to individual communities through a permit program administered by the Illinois Department of Natural Resources.



Much of the region's drinking water is withdrawn from Lake Michigan and treated by the City of Chicago, then either sold at retail to city customers or sold wholesale to other communities. Outlying areas of the region do not use Lake Michigan, relying instead on groundwater or the Fox and Kankakee Rivers. Here water is much less abundant, and deeper wells are "mining" groundwater, meaning that withdrawal rates exceed natural recharge rates. Although the region was able to control this trend in the 1980s and 1990s because many groundwater communities switched to Lake Michigan, use is increasing again, so that water availability is continually declining (Figure X). The Fox and Kankakee Rivers supply water for approximately five percent of the population in the region. According to the State Water Survey, flow in the Fox River will continue to increase as a result of population growth and the associated wastewater discharge. As a result, the Fox River has the potential to supply significant new water demands.



While electricity and natural gas are provided by the private sector under state regulation, drinking water in the region is provided almost exclusively by public utilities, which usually are municipally owned and operated. Providing water to residents is largely in the hands of local governments; their individual and collective actions in the upcoming years will determine how adequately the region confronts increasing demand. CMAP recently completed the *Water 2050* Plan, which projects that while total population will increase by 38 percent through 2050, water demand could increase between 36 percent and 64 percent, depending on the region's policy choices (Figure X). A major conclusion of *Water 2050* is that the region needs to pursue water demand management.

At the local government level, energy use is tightly linked with water treatment and distribution. Electricity constitutes 24 – 40 percent of a typical wastewater treatment plant's budget and 80 percent of the cost of treating and distributing drinking water.[25] Depending on the treatment processes and source of water, it can require 2,700 – 3,700 kWh of electricity per million gallons to withdraw raw water, treat it to drinking water standards, and distribute it to households, then collect and treat the resulting wastewater.[26] When demand for water is reduced, water utilities should see energy savings because of the reduced need for water treatment and conveyance. At the same time, reduced water use results in less wastewater being produced, which in turn can save energy used in treatment. While water production clearly requires energy, the reverse is also true: energy production requires significant water supplies. Thermoelectric power generation uses far more water than any other use sector, at least by total withdrawals.[27] Energy efficiency measures and a shift to renewable sources would help temper withdrawals for power generation somewhat.

Current Conditions: Stormwater Management

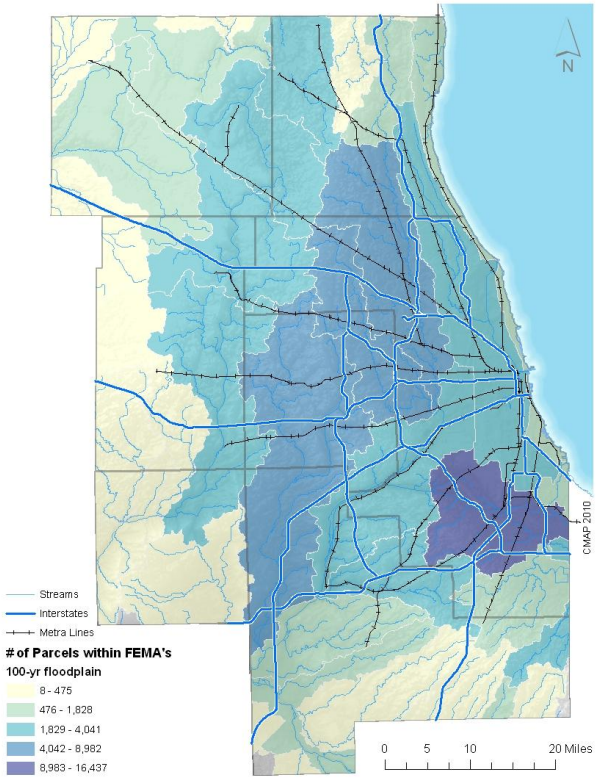
Local government stormwater management requirements grew out of a need to reduce flood damage. Because of its broad floodplains and typically clayey soils, northeastern Illinois is flood prone. The increased runoff from impervious areas like roofs, streets, and parking lots compared to farm fields or woodlands means that flooding will be worse, since more rainfall will be converted to runoff. The first objective of most stormwater management ordinances, therefore, is to limit the rate of peak runoff from a developed site, which is accomplished mainly through detention storage. Traditionally detention basins have been constructed to hold a specified amount of runoff as determined by ordinances, the size of the project, and a number of other factors. The detention basins are then equipped with a flow restrictor to discharge at a specified release rate.

More or less all places in the region have ordinance requirements for detention. Adoption of these standards has been facilitated by northeastern Illinois' unique and very successful countywide stormwater management structure. State law authorizes counties in northeastern Illinois to create "Stormwater Management Planning Committees" with balanced county and municipal representation to prepare a stormwater management plan, to implement the plan through a countywide ordinance, and to fund stormwater management projects and other activities through a property tax levy.[28]The ordinances are adopted by the County Board and provide minimum standards for all municipalities and unincorporated areas within the county, although a municipality may then create stricter criteria if it chooses to do so. In Cook County, this authority was given to the Metropolitan Water Reclamation District. Kendall County has not yet developed a county-wide stormwater ordinance.

Detention remains an incomplete solution, however. It delays stormwater being discharged from a site but does not reduce the actual volume being released.[29] In a large watershed, the cumulative effect of developed sites discharging at the allowable release rate can still result in flooding.[30] Furthermore, urban runoff contains contaminants that are harmful to aquatic life, but

detention generally does little to control this. The county stormwater committees have, to varying degrees, incorporated into their ordinances requirements to address water quality and runoff volume, but challenges remain. A potential solution to these problems is to adopt more thoroughly a "green infrastructure" approach to stormwater management, which tends to preserve, restore, or mimic natural hydrology. Green infrastructure includes methods of using soil and vegetation to promote infiltration of stormwater, uptake by plants, and other techniques to retain a portion of runoff onsite rather than discharging it.

As in the case of buildings constructed before energy codes went into effect, there are many neighborhoods in the region that were built before detention or any other stormwater management requirements were in place. Even after they were required, early detention basins and other stormwater management infrastructure were built with little regard for controlling runoff volume or improving water quality. Because of this, there is reason to examine watersheds in the region to determine their potential for retrofits to improve water quality and control runoff volume. A simple example retrofit would be to construct small bioretention areas in existing parking lots to capture runoff. In other cases, retrofits using green infrastructure mean "disconnecting" existing impervious surfaces, so that they no longer produce runoff that is discharged off-site.



Perhaps the biggest concern, however, is flooding. Many areas in the region — especially the watersheds of the Des Plaines and Little Calumet Rivers, but others as well (Figure X) — are threatened by flooding, which is exacerbated by historic development within floodplains and lack of detention storage. Extensive expenditures have been made on flood control projects, however, but flooding problems remain. Perhaps the largest current program is that of the Metropolitan Water Reclamation District, which has been studying the watersheds of Cook County to identify projects with multiple benefits (flood control, water quality, habitat, etc.) to undertake in its capital improvement program. Other funding sources available to retrofit stormwater infrastructure are limited, however, more so than for energy retrofits. Projects to retrofit stormwater infrastructure for water quality purposes often rely on grants available through Section 319 of the Clean Water Act, which is an important but very small source of funding. Lake County offers a small grant program to leverage other sources like Section 319.

Recommendations

The following sections describe the actions recommended by CMAP to increase energy efficiency and to sustainably manage water resources. CMAP will work in partnership with local governments to investigate the most effective means of implementing recommendations.

Recommendations: Energy Resources

Policies that Reduce Reliance on Automobiles and Reduce Congestion

Responding to a more resource constrained world means pursuing more efficient growth and travel patterns. A major recommendation of *GO TO 2040* is the promotion of livable communities, or compact, mixed use, walkable developments served by transit. Besides their quality of life benefits, they also improve energy efficiency, since they should result in the increased use of lower-energy modes of travel (transit, walking, and biking) over automobiles. Measures to reduce congestion are important as well, as congestion corresponds to wasted fuel. This recommendation is addressed in more detail in other parts of the plan (link).

Retrofit Programs

Retrofit programs provide assistance to property owners to install energy conservation measures in existing buildings. Because existing buildings, especially in the residential sector, may be in use for decades, improving their energy efficiency is a crucial part of achieving conservation goals. The most effective programs combine technical and financial assistance to help property owners make the best choices and provide them with access to capital in order to achieve the highest energy savings for their investment. Typical energy conservation measures improve the heating and cooling systems, hot water heaters, lighting, appliances, or the building envelope itself (insulation, windows, etc.). A national evaluation has shown that household energy consumption can be reduced by an average of 30 percent if comprehensive energy retrofits using existing technologies are implemented,[31] which can result in significant savings on utility bills.

The Chicago Climate Action Plan recognized the significance of this strategy in energy savings and set retrofit targets of 400,000 buildings by 2020. Similarly, the Evanston Climate Action Plan identified the building sector as the one that offers the greatest potential for direct decreases in GHG emissions through energy use reductions, while the Aurora Sustainability Plan calls for technical assistance and incentives to encourage early adoption of energy efficiency measures among both residential and commercial property owners.

Local governments should take a more prominent role in retrofit programs, both working with their residents and businesses and retrofitting municipal buildings. *GO TO 2040* recommends that partners to develop retrofit targets to which they can commit. At the same time, there is a need for increased regional coordination. While there are a number of programs at the federal, state, and utility levels to improve energy efficiency, the difficulty of accessing information on numerous disconnected programs has resulted in limited participation by those who could benefit. This barrier needs to be attacked by establishing a regional information clearinghouse for retrofit programs. However, the major, multi-year task of retrofitting existing building stock

also requires additional financing as well as a trained workforce to carry out the retrofits. The key to a large scale retrofit program is to stimulate a market transformation whereby access to information, finance and, skilled labor are supported by a regulatory environment that promotes retrofit programs. There is much that can be done in commercial buildings as well. Tools such as the Energy Star Portfolio Manager or other energy performance indicators can be used to assess resource consumption in buildings and to help identify retrofit needs.

Because a number of retrofit programs were funded under the American Recovery and Reinvestment Act of 2009, it is prudent for the region to consider sustaining these programs via local financing so that retrofit efforts continue beyond the short term. Continued funding should be sought at the federal and state levels, but there are also several local financing options. For instance, property assessed clean energy (PACE) financing was recently authorized under Illinois law. PACE is a financing mechanism through which loans provided to property owners to retrofit buildings are repaid through their tax bills. Moreover, energy performance contracting, in which energy service companies (ESCO) provide guarantees that savings produced are sufficient to fund project costs, is becoming an increasingly popular financing mechanism as it reduces risks to homeowners and lending institutions.

Green Buildings and Energy Codes

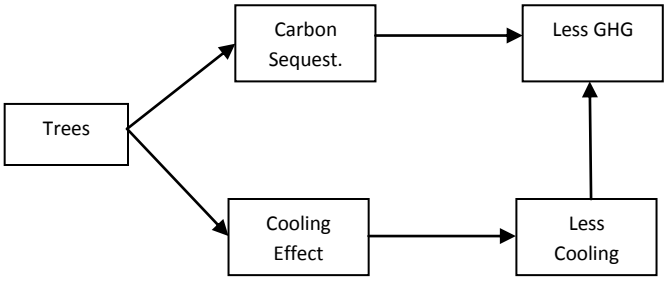
Whereas retrofit programs address existing buildings, energy codes and green building programs improve the energy efficiency of new construction and substantial remodeling. Energy codes are legal requirements that govern the design and construction of buildings by setting minimum standards for energy performance. State law requires newly constructed and renovated residential and commercial buildings to meet the standards set forth in the 2009 version of the International Energy Conservation Code (IECC), a model energy code developed by the International Code Council.[32] It is estimated to result in 12 – 15 percent energy savings over the 2006 IECC.[33] In the short-term, however, there is a need to train local government building inspectors to implement the code requirements.

While they can do so for commercial buildings, local units of government may not for the most part establish residential building code requirements that are more stringent than the 2009 IECC. Energy savings beyond the code may still be encouraged at the local level. For example, an expedited permitting program could be established to lower fees or give review priority to green buildings (defined potentially as achieving a certain rating in the Leadership in Energy and Environmental Design (LEED) program) or green building practices could be made a condition of receiving development assistance.

Urban Forestry and Ecosystem Restoration Programs

Trees provide shade and encourage evaporative cooling, which together help mitigate urban heat island effects (Figure X), as well as act as carbon sinks, at least while they are growing. It has been estimated that a large scale tree-planting program in the Chicago region could cool air temperature by up to 2.5 degrees F, leading to significant savings in air conditioning costs.[34]

Urban forest and tree programs should be implemented at the local level to mitigate the urban heat island effect and provide other important benefits.[35] In addition, the restoration of lands preserved in the Parks and Open Space section would provide a significant amount of carbon sequestration.



Local Governments as Early Adopters of Sustainable Practices

Communities should use their own facilities as demonstration and pilot projects for promoting small-scale renewable generation, which could involve wind and solar power as well as other strategies such as waste-to-energy generation. Local governments should also make a commitment to using alternative fuels in their fleets and public works equipment. At least one municipality in the region has considered using biodiesel generated from locally-gathered wasted vegetable oil.[36] Indeed, communities could undertake a multitude of actions to "lead by example," including the review of procurement processes to ensure the inclusion of green materials for governmental equipment, e.g., the use of compact fluorescent light bulbs or automatic LEDs for street lights, increased use of recycled materials in construction activities, a higher commitment to waste reduction and recycling, etc.

In general, it is important for communities to develop energy efficiency and conservation strategies to help make informed decisions. This would involve an analysis of baseline energy use, a broad identification of potential energy conservation and other conservation measures, and an analysis of their feasibility for implementation.[37] The Chicago Climate Action Plan, as well as the sustainability and climate plans of several other municipalities, have employed such an approach. Communities across the region should develop strategies to determine the best measures to implement locally. Most crucially, these should be integrated into comprehensive planning at the local level.

Recommendations: Water Resources Management

GO TO 2040 supports an integrated approach to water resources planning. This assumes actions that protect and enhance water quality and quantity at all parts of the water cycle. The main theme for these actions is source protection through water use conservation and stormwater management. The following section outlines these actions while supporting the recommendations developed for *Water 2050* (link).

Water Use Conservation

Water 2050 identified thirteen conservation measures that promote efficiency and can reduce or defer the need for a utility to increase its capacity. A subset of these are shown in Figure X. These include retrofitting water fixtures to higher efficiency models, programs that conserve water on "large landscapes" (irrigated areas that are greater than 2 acres), and leak detection,

among others. One of the most important ways local governments can do this is to adopt sensible water conservation ordinances, as these can result in an average of 20 percent savings in water use.[38] In March 2010, CMAP released its updated Model Water Use Conservation Ordinance to serve as a tool to help communities achieve efficiencies in water consumption while deferring the need for infrastructure expansion. As with energy, retrofits with more efficient appliances and plumbing fixtures can result in significant savings in water use. Retrofit programs should be aligned with the WaterSense label, which is assigned by the U.S. EPA to the most efficient water-using appliances, plumbing fixtures and fittings. The model ordinance, which drew widely from existing regulations and literature review, outlines mechanisms by which local governments can assure the installation of WaterSense devices, e.g. retrofit-on-connection, on purchase, or on sale.[39] Water conservation programs through municipal utilities should be combined with energy retrofit programs to increase the dividend.

Table 12: Potential water savings associated with conservation measures at two tiers of implementation

Conservation Measures	Low Conservation (mgd)	High Conservation (mgd)
High Efficiency Toilets[2]	15.0	74.8
Water Waste Prohibition[2]	12.1	60.3
Metering[1]	30.3	31.5
Leaks and Audit Repair[1]	5.9	29.7
Residential Plumbing Retrofits[2]	5.2	26.0
Commercial/Industrial[3]	5.0	25.2
High-Efficiency Clothes Washers[2]	3.2	16.1
Large Landscape[1]	1.0	5.1
Residential Water Survey[2]	0.1	0.7
All Measures - Total	**77.8**	**269.4**

1. Low conservation applies to 10% of demand; high conservation applies to 50% of demand.
2. Low conservation applies to 10% of eligible households; high conservation applies to 50% of eligible households.
3. Low conservation applies to 10% of employees; high conservation applies to 50% of employees. Employee estimates only include public supplied commercial and industrial establishments.

Funding for the measures above can be linked to the State Revolving Loan Funds that are administered by the Illinois Environmental Protection Agency. The Public Water Supply Loan Program (PWSLP) and the Water Pollution Control Loan Program (WPCLP) provide loans with low or zero interest rates to fund the construction, expansion and upgrade of water supply and wastewater treatment facilities respectively. Under the 2009 American Recovery and Reinvestment Act requirements, states must allocate 20% of the loan funds for eligible projects under the Green Project Reserve program. Funding eligibility falls under four categories: Water Efficiency, Energy Efficiency, Green Infrastructure and Environmentally Innovative Projects. IEPA should review criteria for funding to ensure that resource efficiency goals are met.

An increased commitment to conservation can be achieved in the Lake Michigan Service Region, which refers to the communities that draw water supplies from Lake Michigan. These communities report their water use to the Lake Michigan Management Section of the Illinois Department of Natural Resources (IDNR). Form LMO-2 is the annual audit form that municipalities must complete to demonstrate compliance with the conditions of permit and

report on conservation efforts, if any, so that IDNR is able to track water usage. The process is currently conducted at a basic level and does not capture all the information that could potentially be used to promote regional conservation initiatives. By expanding the LMO-2 audit form to collect data on existing permit requirements and additional conservation effort, IDNR can more closely track permit compliance while developing additional regional water supply data. Furthermore, IDNR should make all LMO-2 data available on-line for use by others including the academic community, State Surveys, water utilities, and area planners to allow broad access to this valuable information and to benefit regional and local water supply planning.

Full Cost Pricing

The cost a utility incurs to supply water to its customers includes a number of components, such as the cost of obtaining raw water from ground or surface supplies, treatment to make the water potable, and distribution to users. But there are more than simply the variable costs of operating wells and machinery. Water production is a very capital intensive enterprise, and the physical plant of the utility needs substantial ongoing maintenance. Yet, current municipal water rates often do not reflect the entire cost of supplying water to the end user. For example, the real cost of maintenance or even the cost of new infrastructure may not be completely accounted for in the rate, so that the rate is artificially low. Because of this, consumers have little incentive to conserve water, while municipally-owned utilities are rendered dependent on general revenues or taxes to subsidize development of additional water supplies to meet growing demand.

Municipal utilities should shift toward full cost pricing for drinking water. This can be done in such a way that it encourages conservation and protects water utility revenue; it can also be implemented in such a way that overall municipal revenues are unchanged. More analysis on this subject is available in *Water 2050* (link). This is an area of interest to many communities, but there is a need for more information to help attain the conservation goals in *GO TO 2040* while ensuring predictable revenue streams for utility operations. It is important that such actions be accompanied by public information campaigns as well as proper bill design that facilitate better comprehension of this measure and allow customers to respond accordingly.

Integration of Land Use Policies and Water Resources

Land use policies that encourage compact development should be promoted at the regional and local levels, as compact development is known to reduce residential water use and to reduce capital and operating costs for water utilities.[40] This should be coupled with the identification of sensitive aquifer recharge areas (SARAs) and their protection from potential contamination, which will help ensure the security of water supplies for future generations. Carefully planned development decisions that incorporate the protection of SARAs are essential steps for the integration of water supply and land use planning.

Stormwater Management

Developers, local governments, and county stormwater committees in the region should make a commitment to using green infrastructure to manage stormwater. The use of green infrastructure for infiltration, evapotranspiration and reuse, has many benefits, and studies have shown that it is often less expensive to implement compared to traditional gray infrastructure. Furthermore, green infrastructure practices, such as rain gardens, wetlands, bioswales, permeable pavers, and rainwater harvesting, among others, are adaptable and can be used in settings ranging from urban to semi-rural, both in new development and in redevelopment. Although several communities in the region have recently, or are currently, updating stormwater management regulations to allow the use of green infrastructure for stormwater management, few have established mechanisms for the long term maintenance and funding of these practices. The conventional approach of leaving maintenance of on-site stormwater infrastructure in the hands of private owners generally leads to poor upkeep and performance.

While many area stormwater personnel appreciate the benefits of green infrastructure practices, there is still a certain level of discomfort with using them because of lack of regional performance data, complicating the shift from tried-and-true conventional methods. Thus, perhaps the most important recommendations for green infrastructure implementation are to develop sustainable sources of financing and to provide performance data to stormwater managers. In addition to implementing pilot projects utilizing green infrastructure practices, local governments should explore the feasibility of establishing a fee for long term maintenance of stormwater infrastructure to be charged along with user fees for services such as water provision and wastewater collection.[41] The purpose of the fee is to provide a dependable, dedicated source of funding for stormwater management that is directly related to the runoff produced by a property. The fee can be designed to be revenue-neutral so that the overall municipal levy does not increase.

Stormwater ordinances only apply to new development and redevelopment, but there is a widespread need to implement projects in already developed areas to address flooding, water quality, and other objectives. One of the best ways to determine the kinds of stormwater infrastructure retrofits needed is through watershed planning. Many of these plans have been developed in the region, yet there are numerous watersheds where they have not. Watershed plans should identify water resource problems and evaluate retrofit projects to address them, whether the problem is flooding or poor water quality or loss of habitat. Ideally a watershed plan will consider multi-objective projects that address several problems simultaneously. A major type of stormwater infrastructure retrofit is to implement green infrastructure practices to capture, treat, and potentially infiltrate stormwater that otherwise might be routed to a stream with little or no treatment or even detention.

One of the main benefits of green infrastructure is a reduction in impervious surface. With a commitment to green infrastructure and more compact development patterns in newly developing areas, it should be possible to reduce the creation of new effective impervious surface area. In redevelopment projects, green roofs, rain gardens, or other techniques can also

be used to decrease runoff volumes from a site below what they were prior to redevelopment. Finally, the retrofits recommended in GO TO 2040 will make it possible to "disconnect" existing impervious areas and infiltrate the runoff from them, thus actually reducing the effective imperviousness of already developed areas.

Water Footprinting

Communities should use water "footprinting" as a standard audit method for large-scale projects in conjunction with conservation plans that aim to reduce annual consumption. Water footprint is the total volume of water consumed by an individual, community, or business.[42] In the context of this document, water footprinting refers to water consumption on-site. Water footprinting is useful when applied to large scale projects where the estimated water demand could have a significant impact on the long term plans of a water supply utility. Water footprinting should be used to identify ways to reduce water consumption on site or to help make compensating reductions in demand elsewhere in the system. For example, Nestle was able to reduce its water withdrawal by 28 percent (alongside 76 percent revenue growth) through the use of a business Water Footprint Accounting method, which was used to identify measures to offset the impact on various water supply resources of the total volume of water the company used.[43] While the concept of water footprinting is still fairly new in the U.S., there is an opportunity for northeastern Illinois to be a regional leader in promoting the technique. Water neutrality, full water recycling or total water use reduction, presents an opportunity to move beyond management practices that facilitate water conservation to a more holistic approach for water use reduction.

Recommendations: Energy and Water Nexus

GO TO 2040 recommends policies that will lead to energy use reductions in water and wastewater utilities.

Shift to Surface Water Supplies

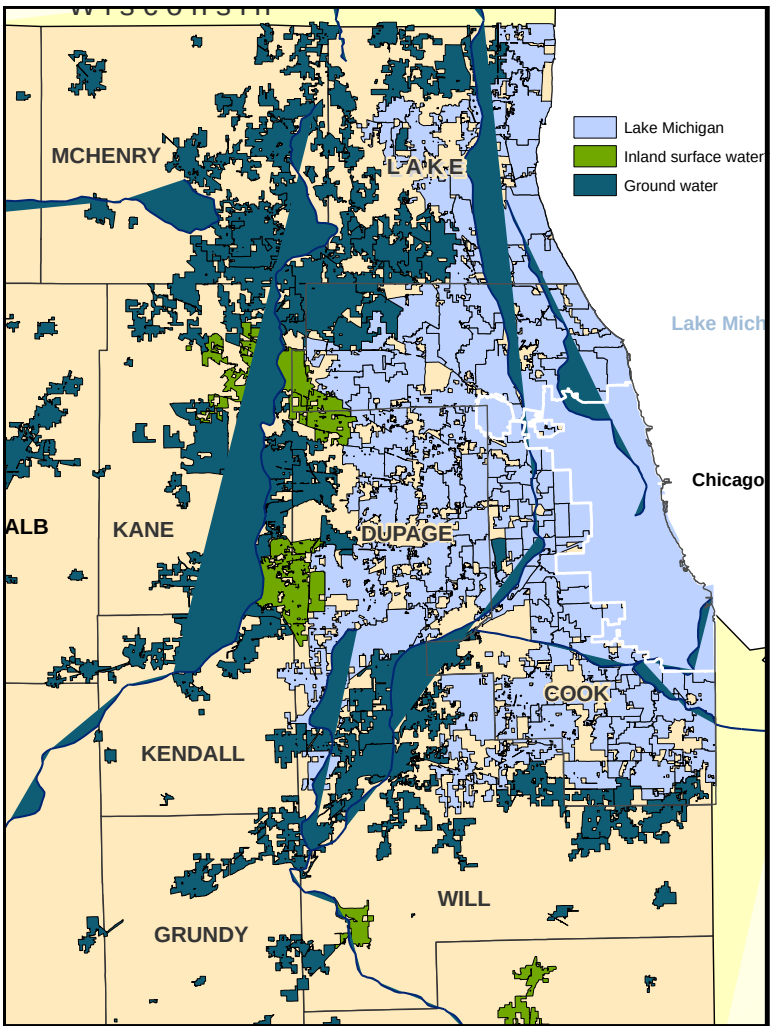
Communities that are currently on groundwater but could potentially access water supplies from the Fox and Kankakee Rivers should explore shifting to those sources. This recommendation is supported by findings from studies by the Illinois State Water Survey (ISWS) showing that the Fox River has the potential to supply 40 – 45 million gallons of water per day (MGD) for future growth. Meanwhile, the shallow and deep bedrock aquifers that supply water to nearby communities are being pumped at rates that exceed the rate of recharge.[44] If communities in the Fox River corridor tap into surface waters for their supplies, they may not only gain resource security but also achieve considerable energy savings, up to a 30 percent reduction in electricity usage.[45] This is primarily because more energy will be expended in pumping from wells in which the water table is increasingly lower.

CMAP is well placed to coordinate with the municipalities identified by ISWS to be at risk of water shortages, and with the Illinois Department of Natural Resources to explore the feasibility of shifting from groundwater resources to the Fox River. There is an opportunity for Councils

of Governments (COGs) or other collaborations such as the recently-formed Northwest Water Planning Area, which aims to continue future water supply planning efforts, to explore shifting to surface supplies and to adopt a coordinated approach to achieving sustainable water supplies. Communities along the Kankakee River could make a similar shift, but it has not been studied to the extent that the Fox has been. CMAP should collaborate with the communities that could potentially benefit from Kankakee River to facilitate studies and modeling by the ISWS.

Water Utility Service Coordination

Over 300 water supply utilities currently provide water for the region from three sources, Lake Michigan, groundwater, and inland surface water (Figure X). Communities dependent on Lake Michigan are mostly served by water that has been treated and processed by the Chicago Water Management Department. Thus, it is particularly relevant for communities that draw from surface water supplies and groundwater to explore consolidation of water service to attain economies of scale. Instead of a number of small utilities, a major supplier may perform the same tasks with higher cost effectiveness, energy efficiency, and better compliance with drinking water regulations.[46] Operation at a larger scale may result in pooling of risks and increased utilization of expertise and technology. This same model can be replicated for communities that receive Fox River water and, potentially, from the Kankakee River. Using the same principle, smaller communities should consider consolidating wastewater systems, which could encourage the utilization of capacity in existing plants instead of the construction of new ones.[47] There are many details to weigh in assessing the value of consolidation. It may mean the formation of a new district or commission to replace several municipal utilities, or it could simply involve a service agreement between two municipalities; it could mean shared facilities, shared billing systems, or other efficiencies. This and other forms of local government service coordination are discussed more fully in Coordinated Investment.



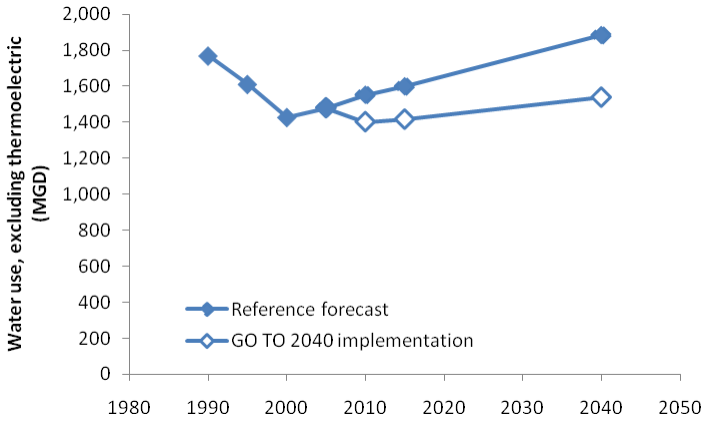
Renewable Generation in Water Utilities

Water utilities should address reductions in energy consumption, and potentially costs, through renewable generation. Increased utilization of solar and wind energy may lower utility energy bills, afford power security and improve air quality. Some utilities that receive 'free power' as a condition in a power franchise agreement[48] may not have sufficient incentive to make the shift to renewable generation; in these cases, discussion should be initiated to discontinue 'free power' to municipalities and to use the funds for retrofit and rebate programs.

Indicators and Targets

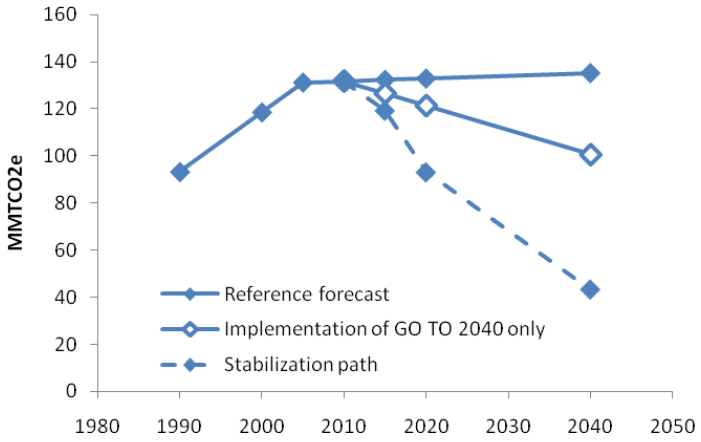
The region's success in managing and conserving energy and water can be measured by three indicators: water demand, greenhouse gas emissions (GHG), and effective impervious surface. The *Water 2050* plan provides demand projections to 2040 (as an interim year) based on three potential demand scenarios. *GO TO 2040* recommends a target that follows the Less Resource Intensive (LRI) scenario, which is predicated on the region choosing policies to reduce future demand. These include an increased commitment to water efficiency, using water rates to encourage conservation, and development patterns that decrease irrigation needs. In 2005, water demand was 1,480 million gallons per day (MGD) as "normalized" to control for drought that year. The year 2010 value was developed as a forecast.

- 2015 target: 1,416 MGD
- 2040 target: 1,539 MGD



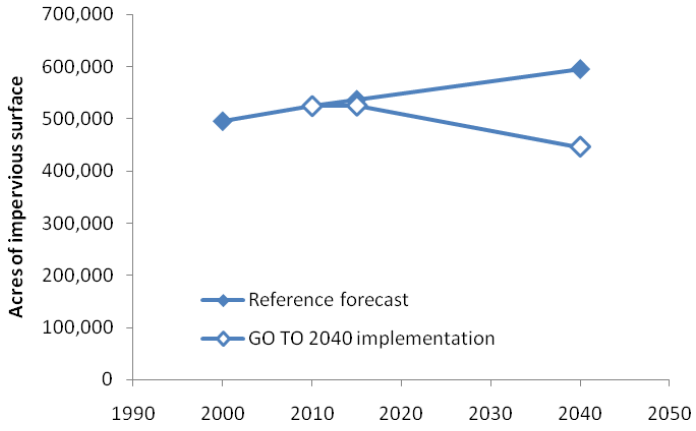
The current level of GHG emissions is 132 million metric tons of carbon dioxide equivalent ($MMTCO_2e$) per year, the "equivalent" being a convention to express the relative effect of other greenhouse gases in terms of the global warming potential of carbon dioxide. A continuation of current trends would likely lead to emissions of 135 $MMTCO_2e$ in 2040. Based on the energy retrofits, transit investments, emphasis on compact development, and other policies recommended in *GO TO 2040*, it would be possible to reduce emissions to 101 $MMTCO_2e$ by 2040, or about 10 percent above 1990 levels. This represents an optimistic but achievable target for voluntary GHG emissions reductions through local and regional actions, concentrating on transportation and energy use in buildings, as they are two areas which can be positively influenced by *GO TO 2040*. However, more significant emissions reductions than this will be needed, on the order of 80 percent below 1990 levels by 2050, which will require federal action to address emissions economy-wide. This is referred to as the "stabilization path," the approximate emissions trajectory needed to stabilize temperatures at a global mean increase of 2 degrees Celsius.[49] Further reduction requires federal regulation to address the carbon content of fuels, industrial emissions, emissions from electricity generation, and so forth.

- 2015 target: 119 $MMTCO_2e$ per year
- 2040 target: 47 $MMTCO_2e$ per year



The total area of impervious surface in the region in 2010 is approximately 525,000 acres. With a commitment to green infrastructure and more compact development patterns in newly developing areas, it should be possible to reduce the creation of new effective impervious surface area. More than this, redevelopment is also an opportunity to reduce effective imperviousness. Green infrastructure retrofit projects identified in watershed plans can also "disconnect" existing impervious areas and infiltrate the runoff from them, thus actually reducing the effective imperviousness of already developed areas.

- 2015 target: 525,000 acres of effective impervious area
- 2040 target: 450,000 acres of effective impervious area



Implementation Area #1: Implementing Energy and Water Retrofit Programs

Action	Implementers	Specifics
Develop a framework for retrofit program administration and increase access to information	CMAP, CNT, City of Chicago	Develop a regional information center for connecting building owners to qualified contractors and financial products, conduct outreach via community-based/trade associations and Chambers of Commerce, use energy audits and web-based applications to provide information to building owners, and introduce marketing and branding strategies for retrofits. Expand the use of financing that is already available, such as the funding from the Energy Efficiency Portfolio Standard.
Provide a financial framework for retrofit programs	State, Municipalities, Utilities, Lending Institutions	Support the development and delivery of financing products targeted across retrofit customer segments. Help support a market transformation to broaden retrofit demand and to give private lenders the confidence to lend to customers for energy efficiency measures. Provide case study data that shows that energy savings are an effective and dependable cash flow stream that can be used to secure loans. Utilities and municipalities should emulate programs as the ones DCEO is currently administering for financing energy and water efficiencies by partnering with retailers to conduct rebate programs to replace appliances/fittings with more efficient models.
Increase access to a trained workforce	Trade associations, community colleges	Develop a regional training center for certified efficiency work. Establish consistent standards and certifications for workers and contractors and create a network to match building owners with certified contractors. Create a "central broker" to match trained job-seekers to businesses seeking certified workers.
Require water retrofit as condition for connection	Counties, Municipalities, Utilities, Realtors	Municipalities should consider requiring property owners to provide proof that appliances and fixtures conform to WaterSense standards prior to connection to water service.[50] Realtors should inform buyers/sellers of this requirement before completing a transaction. Major renovations that require permitting from local governments would be subject to this condition as well. Consider broadening the requirement to Energy Star appliances, although this should only be done in conjunction with a rebate program.

Implementation Area #2: Integrating Land Use Planning & Resource Conservation

Action	Implementers	Specifics
Create model codes/ordinances	CMAP	Assist communities in amending or adopting codes for water conservation by providing ordinance language and related resources. Assist implementation by making available guidance for model review processes.
Accelerate use of efficient appliances/fixtures through green code adoption	Municipalities, Counties	Amend ordinances to reflect requirements of the Illinois Energy Efficiency Building Act and expand on it to include items such as appliances and fixtures. Utilize Energy Star Portfolio Manager/Energy Performance Indicator or other performance indicators for energy efficiency review in commercial and residential buildings.
Provide technical assistance to local governments	DCEO, CMAP	Encourage incorporation of sustainability plans or codes in local planning practices during energy-related grant award processes by prioritizing funding to communities that have taken these initiatives. Allocate funding for the development of green codes. CMAP should offer conservation coordination assistance to communities that wish to employ water conservation practices.
Promote rainwater harvesting for non-potable indoor uses	IEPA, CMAP, MPC, Openlands, Counties, Municipalities	Local governments should ensure that existing regulations do not prohibit the indoor handling of rainwater.. Collaborate in executing informational/demonstrational efforts for the implementation of rainwater harvesting. Amend ordinances and codes accordingly.
Increase commitment to conservation in the Lake Michigan Service Region	IDNR, CMAP	Encourage Lake Michigan Service Region permittees to develop conservation plans and set conservation targets that can be reported to IDNR. Conserving Lake Michigan water by individual permittees is in the interest of the region because it would potentially make Lake Michigan water available to more communities. Permittees should make information available on-line to encourage increased engagement in conservation activities. CMAP should use its relationships and access to communities to assist IDNR with outreach efforts to achieve these recommendations. CMAP should develop a reporting framework/template for communities to demonstrate water management activities to the Lake Michigan Management Section. CMAP should encourage communities to publicize their water conservation milestones.
Identify and protect sensitive recharge areas	ISWS, ISGS, CMAP, Counties, Municipalities	CMAP should lead a collaboration to identify Sensitive Aquifer Recharge Areas (SARA), prioritize those most important for protection, and develop and disseminate model ordinances to ensure their preservation.
Encourage the integration of resource conservation in land use planning	DCEO, CMAP	Use planning grant programs to assist communities to incorporate resource conservation in local comprehensive planning through compact development, transit provision and congestion management. CMAP should offer workshops and planning documents to promote integrated planning.

Adopt policies to encourage attainment of zero water footprints/water neutrality for large scale projects	Municipalities, Water Utilities	Water utilities should require large-scale projects to seek water neutrality. Project sponsors should work with utilities to set an annual water budget following an audit that identifies water saving mechanisms. Project operators should then adhere to the water budget. If the budget is exceeded, as determined by water billing triggers, operators would contribute to local conservation efforts to offset that amount elsewhere in the system.
Implement urban and community forestry programs	Counties, Municipalities, Park Districts	Adopt minimum standards for tree coverage in development projects along with tree preservation and maintenance regulations. Undertake these programs through park districts in public sites. Incentives should be provided for residents to plant trees, such as discounted sales and/or planting assistance.
Use green infrastructure practices to manage stormwater in new development and redevelopment	Counties, Municipalities	Ensure that stormwater management using green infrastructure is integrated in the planning and design phase of development projects. Use infill or redevelopment as opportunities to promote retrofits with green infrastructure in developed areas. Require maintenance plans in the stormwater management permitting process that specify maintenance activities and indicate responsible parties. These plans should be transferrable with property deeds.
Implement green infrastructure retrofits	Counties, Municipalities	Watershed plans for developed areas should identify potential green infrastructure retrofits, such as rain gardens, green streets, parking lot bioretention, and so forth. These plans should be used to help secure capital funding for retrofits.

Implementation Area #3: Pricing

Action	Implementers	Specifics
Utilize full cost pricing to incentivize more efficient water use and to fund conservation programs	Utilities, CMAP	Municipalities should decouple water utility budgets from the municipal general revenue fund and ensure that revenues collected from water billing meet capital and O & M budgets. Utilities should implement metering and appropriate bill designs. Utilities should ensure that bills reflect the full cost of treatment and delivery of water. CMAP should offer technical assistance on conservation pricing and rate-setting.
Institute stormwater utility fees	Municipalities, Counties	Local governments with stormwater management responsibilities should charge dedicated user fees to property owners to cover the costs of maintaining stormwater infrastructure. Such fees should be directly linked to the amount of impervious area on a site. With these revenues in hand, local governments should strongly consider taking maintenance responsibility for stormwater infrastructure on private property, as property owners may not be willing or able to do so.

Implementation Area #4: Funding

Action	Implementers	Specifics
Use State Revolving Funds as mechanism for implementing full-cost pricing	IEPA	Develop criteria that prioritize Public Water Supply Loan Program to utilities that adopt full-supply cost pricing structures in their water billing. Require that water supply utilities develop conservation plans that set annual water use targets to be reported to IEPA as a condition for granting loans.
Use the Green Project Reserve for energy and water efficiencies	IEPA	Utilize the 20% of the State Revolving Funds for water and energy efficiency projects, such as retrofits to pumps and treatment processes, irrigation equipment, reuse of rainwater/stormwater, leak detection equipment, and on-site clean power production.
Implement Energy Performance Contracting	Counties, Municipalities, Utilities	Contract with private energy service companies (ESCO) to identify energy savings potential. Offer cost sharing or loans for property owners for improvements to be paid by consequent cost savings resulting from the installation of energy efficient equipment and fixtures. ESCOs provide guarantees that cost savings will be attained; if not, they pay the difference.
Pursue innovative financing mechanisms for retrofits	Counties, Municipalities, Utilities, Lenders, Illinois Finance Authority	Explore the use of property assessed clean energy (PACE) financing, Green Loan Programs, New Market Tax Credits, Energy Efficiency Ratings Incentives, revolving loan funds and loan pools, etc. for funding energy and water efficiency programs. Form partnerships required to implement these programs with utilities, lending institutions and contractors.

Implementation Area #5: Local governments as early adopters of sustainable practices

Action	Implementers	Specifics
Implement green infrastructure demonstration projects	Counties, Municipalities, Park, Forest Preserve, Conservation Districts	Local governments in the region should implement green infrastructure demonstration projects with regular performance monitoring to further evaluate the applicability of such measures to local conditions. They should utilize available staff and technical expertise/resources to construct and maintain green infrastructure facilities and perform seasonal monitoring, modifying designs to adapt to local conditions as necessary. Local governments should partner with developers in establishing demonstration projects by offering financial assistance/cost share with construction costs.
Utilize green infrastructure practices in all public improvement projects	IDOT, Counties, Municipalities, School, Park, Forest Preserve/ Conservation Districts	All governmental bodies that undertake construction activities should implement policies that require the use of site-appropriate green infrastructure practices for stormwater management.
Consolidate water supply and wastewater treatment services to achieve energy efficiencies and economies of scale	COGs	Local governments should investigate coordinating or consolidating water utilities to enhance cost-effectiveness and lower financial risks. The expansion of existing water supply plants should be emphasized over the development of smaller plants for individual utilities. A common funding stream for plant expansion could be obtained by tapping into collective resources.
Consider devoting the cost of power under franchise agreements to retrofit and rebate programs instead	Municipalities	Municipalities often receive free electric service by utilities as compensation for granting the franchise privilege of using the municipality's public rights of way for the delivery of electricity.[51] Discussion should be initiated to discontinue this and to use the funds instead for retrofit and rebate programs.
Utilize renewable energy generation in water utilities	Municipalities, Utilities	Municipal utilities should seek to employ solar and wind energy to generate all or part of the power required for utility operations. Unused power can be sold back to the grid.
Develop energy efficiency and conservation strategies	Municipalities	Communities should develop a baseline analysis of energy use, broadly identify potential energy efficiency and conservation measures, and analyze the feasibility of implementing them, including the availability of financing. This strategy should be used as an input to local comprehensive planning and as a guide to implementation.

Costs and Financing

(Coming soon)

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[4] The Delta Redevelopment Institute. 2009. *Green Economic Development Strategies for the Chicago Region*. Report prepared for RCF Economic & Financial Consulting and for Chicago Metropolitan Agency for Planning. Available at http://www.goto2040.org/WorkArea/DownloadAsset.aspx?id=17554.

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[8] Delta Redevelopment Institute, *op. cit*.

[9] Delta Redevelopment Institute, *op. cit.*, Appendix A, using data from Renewable Energy Policy Project, June 2006, *Component Manufacturing: Illinois's Future in the Renewable Energy Industry*. The study was conducted at the 6-digit NAICS level.

[10] Center for Neighborhood Technology. December 2009. *The Chicago Region Greenhouse Gas Baseline Inventory and Forecast.* Prepared for Chicago Metropolitan Agency for Planning. Available at: http://www.goto2040.org/uploadedFiles/RCP/Strategy_Reports/PDF_files/CMAP%20GHG%20INVENTORY%20FINAL%2012%207%2009%20_2_.pdf. Also Energy Information Administration, Voluntary Greenhouse Gas Reporting Program: Emission Factors and Global Warming Potentials, available at: http://www.eia.doe.gov/oiaf/1605/emission_factors.html.

[11] Energy Information Administration, *op. cit.*; Center for Neighborhood Technology, December 2009, *op. cit.*

[12] Center for Neighborhood Technology, December 2009, *op. cit.*

[13] Booz Allen Hamilton. 2010 (draft). *Regional Green Transit Plan Carbon Displacement Analysis: Impact Of RTA And Its Service Boards' Operations On Greenhouse Gas Emissions In The Chicago Region*. Report prepared for Regional Transportation Authority.

[14] Reid Ewing, Keith Bartholomew, Steve Winkelman, Jerry Walters, and Don Chen. 2007. *Growing Cooler: the Evidence on Urban Development and Climate Change*. Urban Land Institute.

[15] Center for Watershed Protection. 2003. *Impacts of Impervious Cover on Aquatic Systems*. Available at http://www.cwp.org/Store/guidance.htm.

[16] The wider wholesale power market is the PJM Interconnection. See http://www.ferc.gov/market-oversight/mkt-electric/pjm.asp#MD and http://www.pjm.com/about-pjm.aspx.

[17] http://www.exeloncorp.com/energy/delivery/comed.aspx

[18] Naperville, Batavia, St. Charles, and Winnetka are known to have municipal electric utilities.

[19] Public Act 095-0481, http://www.ilga.gov/legislation/publicacts/95/PDF/095-0481.pdf. Also see http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=IL04R&re=1&ee=1 for a summary.

[20] Energy Information Administration. 2010. *State Energy Profile: Illinois*. Available at: http://tonto.eia.doe.gov/state/state_energy_profiles.cfm?sid=IL.

[21] Information in this section relies primarily on the Center for Neighborhood Technology, September 2009, *op. cit.*

[22] Center for Neighborhood Technology. June 2009. *Creating A Chicago Regional Building Energy Efficiency System*, p. 3.

[23] Public Act 96-033, Section 8- 104, http://www.ilga.gov/legislation/publicacts/96/PDF/096-0033.pdf

[24] Katzenbach Partners. 2009. *Chicago Retrofit Strategy Final Report*. Available at: http://www.chicagoclimateaction.org/filebin/pdf/KatzenbachRetrofitFinalReport.pdf

[25] Griffiths-Sattenspiel, Bevan and Wilson, Wendy. 2009. *The Carbon Footprint of Water*. A River Network Report.
[26] Griffiths-Sattenspiel and Wilson, op. cit., p. 44. The lower figure is for surface water and then wastewater treatment with activated sludge; the higher figure is for groundwater withdrawal followed by advanced treatment.
[27] B. Dziegielewski and F.J. Chowdhury. 2008. *Regional Water Demand Scenarios for Northeastern Illinois: 2005-2050*. Southern Illinois University – Carbondale. Available at: http://www.cmap.illinois.gov/WorkArea/linkit.aspx?LinkIdentifier=id&ItemID=10294.
[28] These counties were DuPage, Kane, Lake, McHenry and Will, and each has passed a countywide ordinance. In P.A. 94-675 (55 ILCS 5/5-1062.2) the authority was extended to Kendall and another five counties. Kendall has not yet adopted an ordinance. P.A. 93-1049 (55 ILCS 5/5-1062.1) gave the Metropolitan Water Reclamation District of Greater Chicago (MWRDGC) the authority to develop a countywide stormwater management program for Cook County.
[29] Engineering Resource Associates, Inc. 2008. *WMO Regulatory Requirement Recommendation: Volume Control Provisions*. Report prepared for Metropolitan Water Reclamation District.
[30] J. Navota and D. Dreher. 2000. *Protecting Nature in Your Community*. Northeastern Illinois Planning Commission and Chicago Wilderness.
[31] Martin Schweitzer, "Estimating the National Effects of The U.S. Department of Energy's Weatherization Assistance Program with State-Level Data: A Meta Evaluation Using Studies from 1993 to 2005," Oak Ridge National Labs, http://www.osti.gov/bridge.
[32] Energy Efficient Building Act, 20 ILCS 3125/45
[33] Energy Efficient Codes Coalition. 2008. *Energy & Cost Savings Analysis of 2009 IECC Efficiency Improvements.* http://www.thirtypercentsolution.org/solution/EECC-Savings_Analysis-Jan-2009.pdf
[34] McPherson, E. Gregory; Nowak, David J.; Rowntree, Rowan A. eds. 1994. Chicago's urban forest ecosystem: results of the Chicago Urban Forest Climate Project. Gen. Tech. Rep. NE-186. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station
[35] A tree in an urban setting may sequester or store 18 kg of carbon, which is equivalent to carbon sequestration by forest trees. The pollution reduction potential of trees includes the removal of particulate matter and ozone; northeastern Illinois is in non-attainment of the air quality standards for both of these under the Clean Air Act. This can lead to 30% savings in air conditioning costs which may result of savings up to $200 per year for a Chicago area household. In wintertime, trees can diminish wind effects by 50%, yielding 7% reductions in heating energy.
[36] The Village of Algonquin is studying the use of vegetable oil for municipal fleets and equipment. Algonquin Environmental Action Plan, 2009.
[37] A model strategy is available at http://www.chicagoclimateaction.org/filebin/pdf/ChicagosGuidetoCompletingAnEnergyEfficiencyandConservationStrategy.pdf.
[38] WaterSense…
[39] The 2010 CMAP Model Water Use Conservation Ordinance contains additional information and resources on retrofit enforcement mechanism. This document can be found at (link)
[40] Speir, Cameron and Stephenson, Kurt. 2002. 'Does Sprawl Cost Us All: Isolating the Effects of Housing Patterns on Public Water and Sewer Costs." Journal of the American Planning Association, 68:1, 56-70.
[41] The Village of Streamwood, IL uses Special Service Areas (SSAs, a taxing system to certain parts of a community) to maintain existing wetlands and upgrade existing stormwater infrastructure. The City of Rolling Meadows, IL charges a stormwater utility fee of $1.65 per 3,604 square feet of impervious area per month.
[42] Water Footprint Network. http://www.waterfootprint.org/?page=files/home
[43] Among the various methods that Nestle employed to offset the impact of their water consumption was the formation of partnerships to deliver clean water where needed and provide technical expertise in water management practices to communities that hosted their facilities. H. Lopez (EVP Operations- Nestle) 2008. The Corporate Water Footprint: What can we do to decrease it? Presented at the World Water Week. Stockholm, Sweden.
[44] *Ibid* 14
[45] *Ibid* 8.

[46] Cromwell, J. and Rubin, S. 2008. Estimating Benefits of Regional Solutions for Water and Wastewater Service. American Water Works Association Research Foundation.
[47] Data from 2006-2007 U.S. EPA Permit Compliance System shows that in the 7-county region, wastewater flows were 1,750 million gallons per day (MGD) while total capacity was 2,501 MGD.
[49] Center for Neighborhood Technology, September 2009, *op. cit.*
[50] *Ibid* 39.
[51] See http://www.comed.com/sites/customerservice/pages/rateinformation.aspx under *Rider FCA - Franchise Cost Additions*.